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ABSTRACT

A comprehensive conceptual framework for the validation of educational programs has been proposed. The conceptual framework includes the concept of an educational program as a system of curricular and instructional claims and methods of evaluation which entail a wide range of judgments of both logical validity and factual validity. Judgments of logical validity are made in reference to the internal structure of each of the claims and its various components, the relationships among the claims constituting a program, and the relationships between the component claims of a program and the bases of the profession under which the program is formulated and operates. The logic of reaching judgments of factual validity of the individual curricular and instructional claims, and of the program as a whole, has been described. Judgments of factual validity of the various component claims, and of the program, are made on the basis of observations of pupil performance and teacher action to determine whether those behaviors correspond to that which is entailed by fulfillment of the goal, rule, and qualifier components of the claims. (Author)

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THE VALIDATION OF EDUCATIONAL PROGRAMS

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Present State Of Educational Program Evaluation

Each year there are volumes of evaluation reports written on the many diverse programs being offered in our educational institutions. This abundance of reports demonstrates that sizable investments are being made in time, effort, and money in order to evaluate current programs. However, the prolific activity alone has not produced a sufficiently comprehensive range of evaluative judgments nor warranted inferences as to program effectiveness. As a result, evaluation reports are often regarded as being not very useful in helping to make decisions about educational programs.

Daniel Stufflebeam, in an address delivered at the Working Conference on Assessment Theory, noted that "The most basic ... [problem] is a lack of adequate theory or conceptualizations pertaining to the nature of evaluation which [is] needed to accommodate educational programs" ([20], p. 8).

The authors of this paper believe that one fundamental reason why program evaluation is inadequate is that there is a lack of continuity between education and the well-developed disciplines (especially, philosophy of science, value theory, logic, theory of action and philosophy of language). Educational evaluators have failed to utilize, to a sufficient degree, the

logical and empirical principles in which evaluations of scientific systems are grounded. Moreover, they have -- by creating a gulf between the language of educational evaluation and the language of evaluation utilized in the natural and behavioral sciences, including their philosophical foundations -- inadvertently cut off the routes to adequate educational evaluation. The resultant crippling limitations in educational program evaluation include (a) inadequate concepts of 'educational program', 'curriculum' and 'instruction', (b) an inadequate concept of 'evaluation' and (c) failure to include judgments of logical structure in program evaluation.

The inadequate concepts of 'educational program', 'curriculum' and 'instruction' result in a vagueness as to the object to be evaluated. Consequently, judgments as to program effectiveness are -- if carefully analyzed -- judgments of hypotheses whose antecedent conditions are unknown.

The inadequate concept of 'evaluation' leads to neglect of the necessary relationship of value judgments to a credible conceptual and value framework, and consequently, to unwarranted judgments about educational programs.

The absence of judgments of logical structure in program evaluation results in such defects as (a) failure to take into account auxiliary hypotheses that are implicitly assumed to be valid, and (b) judgment of the validity of hypotheses on the

basis of non-relevant observations.

Purpose And Organization Of This Paper

The purposes of this paper are to (1) construct an adequate concept of 'educational program', (2) formulate principles for the validation of educational programs in such fashion as to include both logical and empirical considerations, and (3) examine the practical implications of these concepts and principles in reference to educational program development, acceptance, and improvement.

First, the definition of an 'educational program' will be set forth in terms of the concepts of 'curricular claim' and 'instructional claim.' The extra-logical components of a curricular claim will be described and illustrated; and the relationship between 'curricular claim' and 'instructional claim' will be clarified.

Second, the concept of 'validation' will be set forth in conjunction with the related concepts of 'logical validity' and 'factual validity.' Validity, in both its logical sense and its empirical sense, will be construed as a judgment about sentences based on relations between sentences.

Third, principles for the validation of educational programs will be set forth; both logical and empirical principles

will be included. These principles will take into account *a priori* judgments of validity and *a posteriori* judgments of validity.

Fourth, the pragmatics of educational program validation will be examined in reference (a) to the concepts set forth in this paper, and (b) to educational program development, acceptance, and improvement.

CONCEPTUAL ORIENTATIONS

The Concept Of An Educational Program *

Toward An Adequate Concept Of Educational Program

The way in which a person conceptualizes an educaticnal program is strongly influenced by his value orientations. The value orientations expressed by statements of this paper are rooted in the premise that education is (or ought to be) governed by the values of rationality, objectivity, and independent judgment. This premise is supported by such documents as the NEA Code of Ethics [11] and Israel Scheffler's ([18], p. 11) treatment of rationality as the demarcation criterion for distinguishing teaching from other influence activities such as "deception, insinuation, advertising, propaganda, indoctrination, suggestion, bribery, and force."

Under this perspective, the concept of an 'educational program' should be formulated in such a way as to:

(a) Take into account (1) ends to be achieved, (2) the means by which the ends are achieved, and (3) the circumstances under which the means are reasonably applicable; and

(b) Render the beliefs as to the effectiveness of the means, in reference to achievement of the ends, amenable to public verification.

To fulfill these requirements, the beliefs to be verified must be articulated in explicit fashion, i.e. in statement form. At least some statements must be set forth as relationships between the educational ends to be achieved, the means by which they are achieved, and the conditions under which the means may be reasonably invoked; that is, some statements must be articulated in the form of empirically testable propositions.

Moreover, it is crucial to avoid confounding the beliefs under evaluation with the observational bases in which judgments as to the factual validity of those beliefs are grounded.

The Structure Of An Educational Program

An educational program will be construed as a system of statements. The system is composed of propositions, at least some of which are curricular claims, and some of which may be instructional claims.* Each claim links three components: (a) a goal component (ends), (b) a rule component (means), and (c) a qualifier component (conditions under which the means are believed effective for achieving the ends). That is, each claim specifies a relation between some course of action, defined by a set of rules, and attainment of an intended goal-state by an individual (pupil); and includes specification of the set of individuals for which the relation is believed to

** It may be helpful for the reader to familiarize himself with the sections on the concepts of "curricular claims" (see page 11) and "instructional claims" (see page 16).*

be valid.

Curricular claims, or curricular claims in conjunction with instructional claims, constitute the parts of any *system* of statements which fulfills the concept of 'educational program.' Adequate description of a system requires not only identification of its parts, but also identification of various connections among those parts. Consequently, we must delineate the interrelationships within any system of curricular and instructional claims which warrants the denotation of "educational program."

The set of curricular claims may consist entirely of claims that function as primitive sentences and claims which are *derived* from the claims functioning as primitives. Or the set may consist of curricular claims which function as primitive sentences, while other claims are *partially derived* from the primitive curricular claims; in this case, auxiliary hypotheses account for the additional information utilized in the derived curricular claims.

Under this perspective, representation of an educational program requires descriptive statements of at least two different levels of specificity. At one level the program ends, program organizational rules, and program qualifying conditions must be articulated within the context of higher order curric-

ular claims (i.e. "program-level" claims). At a more specific level the ends, procedural rules and qualifying conditions of each curricular component (e.g. "course" component) must be articulated within the context of a more specific curricular claim; these more specific curricular claims must, of course, be at least partially derived from the "program-level" claim or claims.

In some cases, representation of an educational program should be extended to include articulation of certain instructional claims. Only instructional claims whose range of application is synonomous with that of the relevant curricular claim are included within the concept of "educational program." Inclusion of only universally applied instructional claims within the system of claims constituting a program, makes it sensible to construe an educational program in a singular sense rather than as a variable whose replacement values cannot be ascertained.

The set of instructional claims bears a compatibility relation in reference to the set of curricular claims; i.e. no instructional claim may be logically inconsistent nor empirically non-relevant to the set of curricular claims. The substantive elements with which each instructional claim is designed to deal, must be contained within the substantive units specified by the curricular rules.

Further, some instructional claims may be framed at a certain level of resolution. Others may be framed at a more refined, or detailed, level of resolution which gives structure to variables -- contained in other curricular or instructional claims -- that were previously devoid of structure.

The Functions Of An Educational Program

An educational program, construed as a system of claims, makes explicit the goal-states to be attained, the means by which these goal-states are to be attained, and the conditions under which the means are believed effective in reference to goal-state attainment. An educational program construed in this manner provides the framework essential to making judgments in reference to program devolopment, implementation and evaluation.

The functions of an educational program may be viewed from several perspectives. These functions are described in the following paragraphs.

From one perspective, the function of an educational program, as described here, is to guide teacher and pupil action.

From a second perspective, the function is to make possible crucial logical tests, and facilitate identification of significant conceptual weaknesses. Logical tests of these

kinds must occur before initiation of empirical tests.

From a third perspective, the function of an educational program (defined as a system of claims), is to make interpretable empirical tests possible. One way in which this is accomplished is by representing an educational program as a set of related statements. This makes it possible to satisfy the condition of reproducibility, i.e. to achieve reproducibility of treatments and outcomes over different occasions and evaluators.

Representation of an educational program as a set of statements also makes it possible to separate that which is being tested from the observational bases for the evaluative judgments made. (For further explication, see the subsequent sections on curricular and instructional claims and principles of educational program validation.)

Curricular Claims *

Each curricular claim is a proposition which links three components: (a) a goal component, (b) a rule component, and (c) a qualifier component. A curricular claim specifies a relation between some course of action, defined by a set of rules, and attainment of an intended goal-state by an individual (pupil); and includes specification of the set of individuals for which the relation is believed to be valid. A curricular claim will be viewed as an hypothesis to which both teacher(s) and pupils subscribe, and under which both act.

A generalized curricular claim might be represented in the following way:

Generalized Curricular Claim

For each pupil X, where X satisfies conditions C;
If both the teacher(s) and a set of pupils,
of which X is a member, act under rules R,
then X will (probably) attain goal-state S.

The 'generalized curricular claim', as used here, is a proposition generator, i.e. a curricular claim generator, but itself cannot be judged true or false. The 'curricular claim,' however, denotes a proposition which can be judged true or false.

A curricular claim contains both logical terms, e.g. 'if,' 'then,' and extra-logical components which are linked by the logical connectors. The extra-logical components will be

* *This section on curricular claims is drawn from the paper, "The Nature and Significance of Curricular Claims and How They Are Validated" (John Lottes and Emajean McCray), presented at the 1975 AERA Conference,* [13].

labeled: *curricular goal-state, curricular rules,* and *curricular qualifying conditions.* These linguistic structures provide the organizational framework for teaching and learning activity. Simple examples of these extra-logical components are displayed within the context of the illustrative curricular claim in Figure 1.

The *curricular goal-state* is represented in the form of a set of concepts or sentences (inclusive sense of 'or'), and denotes some desired individual pupil-state. This representation must have empirical import: the state of affairs denoted by the 'curricular goal-state' must, in principle, be capable of realization and of meaningful test to determine whether its conditions have been fulfilled.

Curricular rules are rules which govern the actions [2] of both teacher and pupil. They 'rule in' some acts and 'rule out' other acts. Still other acts (such as chewing gum) may be value-free in reference to the rules. Ordinarily, curricular rules (ought to) include a *substantive* aspect and also a *regulative* aspect.

We will construe the substantive aspect of a set of curricular rules in such a way as to include:

(a) *Identification of the basic elements, units, or parts with which the participants (i.e. teacher and pupil) will deal.* These basic

Figure 1

AN ILLUSTRATIVE CURRICULAR CLAIM.

For each pupil X, where X satisfies these qualifying conditions:

C[1]: X is characterized by adequate language usage in reference to its semantic, syntactic, and pragmatic aspects;

C[2]: X is characterized by comprehension of the principles of deductive and inductive logic;

C[3]: X places high values on rationality, objectivity, and independent judgment;

If both the teacher (or teachers) and the set of pupils, of which X is a member, act under the following curricular rules:

Substantive Rules

R[1]: "Problems of social conflict" will constitute the basic curricular units (i.e. elements);

R[2]: The set of problems will be partitioned into three disjoint subsets:

Subset A - a set of problems, each of which entails resolution of a conflict between two individuals,
Subset B - a set of problems, each of which entails resolution of a conflict between an individual and an organized group of individuals (i.e. an organization),
Subset C - a set of problems, each of which entails resolution of a conflict between two groups of individuals (i.e. between two organizations);

Regulative Rules

(Initiation Rules)

R[3]: Any participant (i.e. teacher or pupil) may propose a problem for acceptance by any pupil or group of pupils;

R[4]: Adequate resolution of some problem belonging to Subset A by a pupil is a condition of acceptance of a problem of Subset B by that pupil; and, adequate resolution of some problem of Subset B is a conditions of acceptance of a problem of Subset C.

R[5]: If a pupil and the teacher both accept a problem proposed for acceptance by that pupil, then that pupil must attempt its resolution.

(Activity Rules)

R[6]: Problem resolution as a collective (team) enterprise is permissible; where, each member of a team is independently accountable for both process and product.

R[7]: The teacher must provide critical analysis on request of any pupil; substantive guidance on the part of the teacher is permissible under the condition that the pupil has accepted a proposal of substantive guidance.

(Termination Rule)

R[8]: Efforts toward resolution of a problem by a pupil will terminate when: (a) a pupil claims that the problem is resolved, or it is impossible to resolve the problem, or it is not fruitful to attempt problem resolution under the existing circumstances; and (b) the teacher accepts the claim.

(Validation Rules)

R[9]: Any participant who makes, or accepts, a proposal or claim is obligated to clarify or validate the proposal or claim on demand of any other participant.

R[10]: All participants are obligated to validate statments and actions under the conditions of (a) rational action, (b) adequate language usage in reference to its semantic, syntactic, and pragmatic aspects, and (c) the principles of inductive and deductive logic.;

then X will (probably) attain this curricular goal-state:

- The ability to apply credible problem-solving principles in situations involving social conflict,

and

- the intention of applying those principles under circumstances where the individual makes the judgments that (a) a significant problem of social conflict exist, (b) he has both the responsibility and opportunity of contributing to resolution of the conflict, and (c) his action would have a reasonable chance of leading to problem resolution,

and

- the action pattern of consistent application of the problem-solving principles where such judgments are made.

units may be concepts or principles, problems, activities, aesthetic objects, etc.; and

(b) *Identification of the interrelationships among the basic elements, units, or parts with which the participants will deal.*

The regulative aspect of a set of curricular rules specifies the ways in which the teacher and pupil, or pupils, should act in relation to each other, and in relation to the basic units of the enterprise. We will construe the regulative aspect of curricular rules in a way which includes:

(a) *Identification of the ways in which actions, in relation to the basic curricular units, will be initiated, conducted, terminated, and validated;* and

(b) *Identification of that which is obligatory, permissible, or not permissible on the part of both teacher and pupil.*

The *curricular qualifying conditions* consist of a set of propositions which describe the pupil-state assumed to be necessary to effective functioning under the curricular rules, and in reference to the curricular goal-state. Of course, the pupil must have had prior opportunity of achieving the state of affairs denoted by the qualifying conditions since judgment as to the factual validity of the propositions, in reference to each potential pupil, must be made before the curricular rules are invoked.

The extra-logical components of a curricular claim govern instructional and learning activities in much the same way that

the rules of a game govern the activities of all players through the course of the game.

The rules of any game make some actions mandatory for each player, some actions permissible, some actions forbidden, and other actions value-free; on the other hand, each player is allowed some degree of freedom to determine the way in which even most mandatory acts will be performed. Consequently, each player develops an individual strategy that guides the way he performs individual acts during the course of the game. Moreover, each player characteristically changes his strategies in response to the acts of opposing players. These strategies must conform to the rules of the game and, of course, have the purpose of achieving the goal of the game.

In an analogous way, curricular rules make some actions obligatory on the part of the pupil or teacher, while making some actions permissible, some actions not permissible, and other actions value-free in reference to the rules. The curricular rules leave both teacher and pupil some degrees of freedom to determine the way in which their individual acts will be performed. The teacher develops strategies for influencing the pupil toward goal-state attainment, and adapts these strategies in response to the patterns of individual pupil acts. The pupil, deliberately or otherwise, forms strategies which guide his individual acts toward goal-attainment, and adapts these strategies in response to the patterns of individual

teacher acts.

It is important to recall that we are viewing education as a cooperative enterprise where both teacher(s) and pupils have subscribed to the same curricular rules and goal-state. Both teacher strategies and pupil strategies, as well as their individual acts, should conform to the common rules.

Of course a given strategy is reasonable only if its user believes that, under the existing circumstances, implementation of that strategy will lead to achievement of certain ends. Moreover, within the professional context, a teacher's strategy is justified only when it is imbedded within the rule component of some claim that the teacher has reason to believe is valid. This sort of a claim will be called an *instructional claim.*

*Instructional Claims**

The concept of *instructional claim* is instrumental to realization of the various conditions imbedded within a curricular claim, thus rendering it crucial to curricular claim validation. Both teacher and pupil(s) subscribe to, and act under, a curricular claim. But, only the teacher subscribes to, and acts under, an instructional claim.

A generalized instructional claim might be represented in the following way:

** The section on instructional claims is drawn from the 1975 AERA paper, "The Nature and Significance of Curricular Claims and How They Are Validate;" (John Lottes and Emajean McCray),* [13].

Generalized Instructional Claim

For each pupil X, where X satisfies conditions I,
If the teacher(s) acts under rules T, in relation
to a set of pupils of which X is a member,
then X will (probably) attain goal-state G.

The extra-logical components of an instructional claim will be called: *instructional goal-state, instructional rules,* and *instructional qualifying conditions.* Each of these components will be illustrated within the context of the sample instructional claim displayed in Figure 2.

The *instructional goal-state* can be articulated in the form of a set of concepts or sentences (inclusive sense of 'or') which represent some intended individual state of affairs to be achieved by the pupil. The instructional goal-state can be synonomous to the curricular goal-state, logically or ethically necessary to attainment of the curricular goal-state, or empirically useful to attainment of the curricular goal-state.

Instructional rules are represented as a set of rule-statements which determine each individual act that the teacher will perform in every acting-situation expected to occur. Instructional rules constitute a plan, or a set of procedures, formulated for the purpose of guiding teacher actions. The teacher is free to modify, or replace entirely, any set of instructional rules under which he intends to act. However, neither the instructional rules nor consequent teacher acts

Figure 2

AN ILLUSTRATIVE INSTRUCTIONAL CLAIM *

For each pupil X, where X satisfies these instructional qualifying conditions:

I[1]: *X* comprehends the basic problem-solving paradigm,

I[2]: *X* is deliberately aware of, and can utilize, credible sources of both causal and teleological explanations of human behavior,

I[3]: *X* has adequately resolved at least one problem of Subset A;

If the teacher(s) acts under these rules in reference to a pupil subset of which X is a member:

T[1]: The teacher (*T*) will propose that the pupil subset, including *X*, assume the responsibility of identifying, and proposing for resolution, a problem of practical concern to each pupil of the subset; and, where resolution of a conflict between an individual and a group of organized individuals (i.e. organization) is entailed.

T[2]: If the responsibility is accepted by each pupil of the subset, then *T* will follow these rules:

(a) *T* will initiate no moves relative to the problem identification, or subsequent resolution, efforts of the pupil subset;

(b) On any occasion that any pupil, or pupils, of the subset claims that (1) some step or steps toward identification or resolution of a significant problem have been adequately performed, or (2) the problem has been adequately identified or resolved, then *T* will demand justification of the claim; and, if *T* perceives that the justification in not adequate, then *T* will illuminate the defect by the Socratic method;

(c) If any pupil, or pupils, of the subset requests guidance as to what moves to make or how to make them, then *T* will either (1) suggest potentially useful information sources, or (2) provide explanation or illustration in a manner that minimizes synthesis by *T* and maximizes synthesis by the pupil or pupils.

T[3]: If the pupil subset does not accept the proposed responsibility, then *T* will follow this rule:

First, *T* will act in a manner governed by the curricular rules in attempting to resolve the issue; and, if that fails, then *T* will enter the diagnosis, explanation, remediation mode for identifying and resolving unanticipated classroom problems (under the curricular rules).;

then X will (probably) attain this instructional goal-state:

- The ability to apply credible problem-solving principles in some situations involving conflict between an individual and an organized group of individuals.

* *This instructional claim has been constructed in reference to the illustrative curricular claim displayed in Figure 1, and is compatible with that curricular claim.*

may violate the curricular rules to which both teacher and pupil have subscribed. Otherwise, realization of rationality would be thwarted; and, empirical test of curricular claims could not be achieved.

The *instructional qualifying conditions* consist of a set of propositions describing the existing state of a pupil. The pupil-state is described in reference to (a) the curricular rules or curricular goal-state, or (b) some instructional goal-state contained within an instructional claim which is adequate in reference to the curricular claim (or claims), or (c) individual pupil goals, strategies, or assumptions under which the pupil acts. Instructional qualifying conditions are *intra-curricular* whereas curricular qualifying conditions are *extra-curricular*.

The Concept Of Validation

The Meanings Of Measurement And Evaluation

S. S. Stevens, in "On The Theory of Scales of Measurement" [19], set forth a widely used definition of *measurement:*

> *Measurement is the assignment of numerals (i.e. symbols) to objects or events according to rules.*

Stevens also distinguished among four different levels of measurement: nominal, ordinal, interval, and ratio. Nominal and ordinal levels of measurement satisfy certain classificatory or comparative, but non-arithmetic, properties. Interval and ratio levels of measurement satisfy the classificatory and comparative properties, and certain arithmetic properties as well.

It is fruitful to construe *evaluation* as a particular kind of measurement, and the definition which follows is governed by this perspective.

It is significant to observe that the concept of *value* is imbedded within the term "e *valu* ation;" i.e. *e-valu(e)-ation* ([16], p. 61). Evaluation will be defined here in such a way as to appeal to values in the process of assigning symbols to objects of evaluation. 'Value terms' will constitute the symbols to be assigned; e.g. 'good,' 'fair,' 'poor,' or 'adequate,' 'inadequate,' etc. These terms are assigned

according to the degree to which certain values are realized by the object being judged.

The following definition of evaluation borrows substantially from Nicholas Rescher's Introduction To Value Theory ([16], pp. 61-72):

> *Evaluation is measurement, conducted within a value framework, and resulting in the assignment of a value term (e.g. good-bad, adequate-inadequate, valid-invalid, etc.) to the object or event under evaluation. The assignment (i.e. judgment) is made on the basis of:*
>
> *(1) the extent to which the value (or values) is realized in the object or event; or*
>
> *(2) the extent to which the object or event facilitates realization of the value by some other object or event.*

This definition has several important virtues. First, its meaning is precise, assuming one uses Rescher's meaning of value ([16], pp. 8-10) and Stevens' meaning of measurement. Second, the relationship between measurement and evaluation is defined. Evaluation is a particular kind of measurement; it is measurement at ordinal, interval, or ratio level. Third, this meaning of evaluation is consistent with the usage of the term in mathematics, the sciences, analytic philosophy, and other more rigorous disciplines. Fourth, it will be useful in our present context.

The Meaning Of Validation

Validation

Validation is the process of making judgments of validity. Judgments of validity are judgments of statements, and these judgments are based on logical (deductive or inductive) relations between statements. In validating an educational program, we are, of course, interested in making judgments of statements of the types that we have labeled 'curricular claims' and 'instructional claims.' These judgments of statements may be judgments as to *logical validity* or judgments as to *factual validity* [4].

Logical Validity And Factual Validity

The principles of logic constitute grounds for determining whether one sentence (i.e. "conclusion") is a consequence of another sentence or set of sentences (i.e. premises). If the relevant principles are realized, i.e. if the conclusion is a justified deductive inference in reference to prior sentences, then the concluding sentence is judged to be *logically valid* with respect to those premises. If, under the logical principles being applied, the conclusion is demonstrably false, then the concluding sentence is judged to be *logically contravalid.* In other cases it may not be possible to make a justified

judgment on the basis of logical rules alone; in this event the concluding sentence is *logically indeterminate.*

Some sentences are called *factual propositions* ([7], pp. 16-21). Factual propositions are statements that have some bearing on empirical objects or events. Factual propositions, some of which are called 'hypotheses,' must be judged on the basis of their relation with sentences which describe observational data. If a factual proposition corresponds with the observation sentences, or observation reports, then that set of observation sentences is viewed as having confirmed the factual proposition to some degree. In this event, and in a very tentative sense, the proposition is judged to be *factually valid.* If the set of observation sentences does not correspond with the factual proposition, then that proposition is disconfirmed to some degree; the factual proposition is then judged tentatively to be *factually contravalid.* In reference to observation sentences which do not fulfill certain semantical conditions, it may be impossible to make a justified judgment about the factual proposition; in this case the proposition may be viewed as *factually indeterminate* in reference to those observation sentences.

Carl Hempel, in Aspects Of Scientific Explanation [5] has noted that the relation between an hypothesis and relevant observation sentences is a basically semantical relation. Hempel

has illustrated this relation within the following explication of the view of confirmation as a relation between sentences:

> "It is possible ... to construe confirmation ... as a relation between two sentences, one describing the given evidence, the other expressing the hypothesis. Thus, instead of saying that an object *a* which is both a raven and black (or the fact of *a* being both a raven and black) confirms the hypothesis that all ravens are black, we may say that the evidence-sentence, '*a* is a raven, and *a* is black' confirms the hypothesis-sentence ... , 'All ravens are black.' We shall adopt this conception of confirmation as a relation between sentences for the following reasons: First, the evidence adduced in support or criticism of a scientific hypothesis is always expressed in sentences, which frequently have the character of observation reports; and second, it will prove very fruitful to pursue the parallel ... between the concepts of *confirmation* and *logical consequence*. And just as in the theory of the consequence relation, i.e. in deductive logic, the premises of which a given conclusion is a consequence are construed as sentences rather than as 'facts,' so we propose to construe the data which confirm a given hypothesis as given in the form of sentences ([5], pp. 21-22)."

Under the preceding perspectives, validation is construed as the process of making judgments as to the logical validity or factual validity (i.e. confirmation) of sentences. Moreover, judgments of both kinds are made on the basis of relations between sentences. Validation is construed here as a particular kind of evaluation, just as evaluation is a particular kind of measurement.

Significance Of The Concept Of Validation

There are several reasons for introducing the concept of validation. First, the concept of validation seems compatible with the view of an educational program as a system of claims. Validation, as a particular kind of evaluation, is concerned with the process of testing such claim systems.

The second reason is a psychological one. There is a need to remove the psychological barriers created when one uses the expression "evaluation of educational programs."

A third reason for introducing the concept of validation is to focus attention on the worth of modelling more extensively on the language of science; thus creating continuity between education and the disciplines.

*PRINCIPLES OF EDUCATIONAL PROGRAM VALIDATION**

Overview

An educational program has been conceptualized as a system of claims. This system includes at least some curricular claims, and may include instructional claims as well. Meanings of the extra-logical components of the curricular and instructional claims have been set forth and illustrated. The functions of this linguistic structure are to guide teaching and learning activity, and consequently, to provide the bases for making valid judgments of validity.

Educational program validation, in the sense used here, entails making a wide range of judgments of validity. These include judgments made before the educational program is actually submitted to empirical test. Such judgments are made in order to determine whether the educational program warrants empirical trial in the first place. Assuming that the program passes these various tests of its potential worth, it is then reasonable to submit it to empirical trials of its various predictive implications.

Explication of these two crucial aspects of educational program validation is provided in the succeeding sections. First, we will consider *a priori* aspects of educational program

* *The principles of educational program validation set forth in this section are based upon prior papers by John Lottes [9], and John Lottes and Emajean McCray [13]; the present paper explicates the basic principles in a more precise and comprehensive way, and formulates new principles that apply only to systems of curricular and instructional claims.*

validation; second, we will consider *a posteriori* aspects of educational program validation. *A priori* refers to those aspects of validation conducted prior to the decision as to whether predictive tests of factual validity are warranted. *A posteriori* refers to those aspects of validation conducted consequent to such a decision (assuming that the *a priori* judgments are favorable to the educational program).

A Priori Aspects of Educational Program Validation

Three different kinds of judgments should be made prior to the decision as to whether a proposed educational program merits empirical trial. First, judgments should be made as to whether the educational program has adequate meaning. Second, judgments should be made as to the systemic import* of the educational program. Third, judgments should be made as to the potential factual validity of the educational program. All of these judgments are reducible to judgments of logical validity or** judgments of factual validity of sentences.

* *The notion of 'systemic import' is borrowed from Carl Hempel's concept of 'systematic import of scientific concepts' ([6], pp. 91-97), and liberally adapted to fit our own perspectives of system in education.*

** *Or is used here in the inclusive sense.*

Judgments Of Meaning

To insure against expending energies in the conduct of empirical tests which are incapable of interpretation, there must exist some warranted conditions for differentiating educational programs that are capable of interpretable empirical test from those which are not.

The conditions of interpretable empirical test are, in fact, conditions of adequate meaning. These conditions include requirements as to (a) the forms of the claims, (b) the internal consistency of the various extra-logical components, and (c) the possibility of instantiating each extra-logical component. Judgments made in reference to each of these requirements must be made on logical grounds alone.

The conditions, each of which is necessary to empirical import, are delineated as "conditions of adequate educational program meaning" in the following display.

CONDITIONS OF ADEQUATE EDUCATIONAL PROGRAM MEANING

C[1]: Each curricular claim is synonomous with some sentence of the form:

For each pupil X, where X fulfills conditions C;
If both the teacher(s) and a set of pupils of
which X is a member, act under rules R,
then X will (probably) attain goal-state S.

C[2]: Each instructional claim is synonomous with some sentence of the form:

For each pupil X, where X satisfies conditions I,
If the teacher(s) acts under rules T, in relation
to a set of pupils of which X is a member,
then X will (probably) attain goal-state G.

C[3]: No extra-logical component of the claims (curricular or instructional) contains a logical contradiction.

C[4]: Each statement which contains -- as a predicate -- an extra-logical component of the claim, is capable, in principle, of empirical test to determine whether its implications are realized.

C[5]: No extra-logical component may contain a statement, of which a pupil is not the subject, that is factually contravalid.

Judgments Of Systemic Import

"Systemic import" refers to the interconnections among the various parts of a structure. A set of unrelated elements lacks systemic import. The systemic import of an educational program can be assessed from two perspectives: (1) the relationships among the various claims that constitute the program, and (2) the relationships between these claims and the professional framework that has governed the framing of those claims.

The statements representing an educational program, classified as either curricular or instructional claims, should be systemically related. These within-program connections should include at least: (a) between goal-state relationships, (b) between rule-set relationships, and (c) relationships between qualifying components and goal-state components.

Formulation and validation of an educational program are fundamental responsibilities of professional educators. Under this perspective, the form and substance of an educational program, the manner of its realization, and the methods of validation must be consistent with the bases of the education profession. These professional bases include the aims and functions of education (i.e. pragmatic base), credible concepts and principles (i.e. conceptual base), and value orientations and ethical norms (i.e. value base) ([12], Part One). Therefore, an

educational program should be judged on the basis of relations between statements contained in the program and statements which represent the professional bases of education.

The systemic import of an educational program should be judged in reference to at least the following conditions.

CONDITIONS OF ADEQUATE SYSTEMIC IMPORT OF AN EDUCATIONAL PROGRAM

C[1]: Each curricular goal-state must be consistent with the educational aims to which the profession is committed.

C[2]: All curricular and instructional rules must be permissible in reference to the value orientations and ethical norms of the profession.

C[3]: The statements representing any (ostensibly) derived goal-state (curricular or instructional) must be:

(a) synonomous with the statements representing the primitive goal-state, or

(b) logically valid in reference to statements representing the primitive goal-state under the transformation rules of either class logic or propositional logic.

C[4]: The statements representing any (ostensibly) derived set of rules (curricular or instructional) must be:

(a) synonomous with the statements representing the primitive rules;

(b) logically valid in reference to statements representing the primitive rules under the transformation rules of propositional logic or deontic logic; or*

(c) logically valid in reference to statements representing the primitive rules taken in conjunction with additional auxiliary hypotheses.

* *Or is used here in the inclusive sense.*

C[5]: *For any set of sequentially related curricular claims, the goal-state conditions of any predecessor claim must be contained within the set of qualifying conditions of its successor claim.*

C[6]: *No curricular goal-state may contain a sentence which is the logical contradiction of a sentence contained in another curricular goal-state.*

C[7]: *No instructional strategy (i.e. set of instructional rules) may constitute a logical contradiction of the set of curricular rules under which that strategy is invoked.*

C[8]: *Each instructional strategy must be logically relevant to the set of curricular rules under which that strategy is invoked (i.e. the instructional strategy should specify teacher actions to be taken in fulfillment of the curricular rules).*

C[9]: *The probability of pupil attainment of the curricular goal-state, given instructional goal-state attainment, is greater than the probability of curricular goal-state attainment, given non-attainment of the instructional goal-state.*

Judgments Of Potential Factual Validity

Assuming that we are governed by the conditions of rational action, then two additional kinds of *a priori* judgments must be made. These are judgments as to whether (a) there is good reason to believe that the curricular rules and associated set of instructional rules, if invoked, are likely to lead to attainment of their respective goal-states, and (b) there is good reason to believe that the proposed educational program is likely to lead to benefits not available under existing educational programs.

The relationships specified by curricular and instructional claims, taken separately or collectively, are empirical relationships. The propositions offered as reasons in support of the belief that these relationships will prove factually valid must be grounded -- either directly or indirectly -- in confirming observational evidence. Consequently, these supporting reasons can provide crude information as to the likelihood that the curricular or instructional claims will prove factually valid even before direct empirical tests are conducted. Hence, judgments as to the quality of these reasons are called judgments of "potential factual validity." The conditions of adequate potential factual validity are set forth in the following display.

CONDITIONS OF ADEQUATE POTENTIAL FACTUAL VALIDITY OF AN EDUCATIONAL PROGRAM

*C[1]: The empirical relation between the set of instructional rules and an instructional goal-state, as specified by the instructional claim in which those extra-logical components are housed, must be supported by sound reasons.**

*C[2]: The empirical relation between the set of curricular rules and a curricular goal-state, as specified by the curricular claim in which those extra-logical components are housed, must be supported by sound reasons.**

C[3]: Instructional goal-state attainment, by pupils satisfying the instructional qualifying conditions, must be potentially effective in relation to attainment of the associated curricular goal-state.

C[4]: Lower-level curricular goal-state attainment, by pupils satisfying the lower-level curricular qualifying conditions, must be potentially effective in relation to attainment of the higher-level curricular goal-state.

* *These reasons should consist of empirical propositions for which there is some reasonable degree of factual confirmation, and may be drawn from education or any relevant field of behavioral or natural science, praxiology, or technology.*

A Posteriori Aspects Of Educational Program Validation

The Logic Of Testing A Curricular Claim

Suppose that we have formulated a particular educational program (i.e. set of claims) including the precise articulation of the various statement sets which constitute their extra-logical components. Suppose also that the set of claims satisfies all the foregoing *a priori* tests. Only at this point is it reasonable to conduct empirical trials to determine the factual validity of the claims.

In order to make a justified judgment as to the factual validity of a specified curricular claim, denoted by C, a number of things must be accomplished. These aspects (borrowed from Carl G. Hempel's, *Philosophy of Natural Science* ([6], pp. 6-25)) include the following:

a. Idenfification of significant auxiliary hypotheses, $A_1, A_2, A_3, \ldots, A_n$.

b. Specification of the test implication, T, which is to be judged *factually valid*, *factually contravalid*, or *factually indeterminate* on the basis of observation sentences.

c. Formation of observation sentences on the basis of *sense-data* ([17], pp. 7-16).

d. Judgment of factual validity of the test implication, T, on the basis of its relations to the set of observation sentences.

e. Judgment of factual validity of the (more general) curricular claim, C, taken in conjunction with auxiliary hypotheses $A_1, A_2, A_3, \ldots, A_n$.

Even though the curricular goal-state, curricular rules, and curricular qualifying conditions are specified in curricular claim *C*, the claim still contains variables. A particular pupil (i.e. the replacement for *X*), a particular set of pupils of which *X* is a member, and a particular teacher or set of teachers have not been specified in *C*. The curricular claim is sufficiently general to be tested over a wide range of particular teacher and pupil sets.

A test implication, *T*, or "statement describing the observable consequences to be expected," can be framed by merely plugging in particular pupil names and particular teacher names for the variables of claim *C*. It should be noted that this example represents the simplest of cases. The curricular claim *C* might contain, in other cases, highly abstract extra-logical components, whereas the extra-logical components of *T* might be framed in more elementary terms.

Formation of a test implication typically demands at least tacit assumption of certain premises, or *auxiliary hypotheses*, in addition to the hypothesis being tested. In reference to our present purpose, these auxiliary hypotheses should include the relevant set of instructional claims (i.e. hypotheses), denoted by $I_1, I_2, I_3, \ldots, I_k$, which are construed as components of the educational program.

The empirical test of the curricular claim C now involves the auxiliary hypotheses (instructional claims) I_1, I_2, I_3, ... , I_k* and the test implication T. The logic of the test can be displayed in the following way ([6], pp. 22-25):

> If C is true, and I_1, I_2, I_3, ... I_k are all true, then T is true.
>
> T is not true (i.e. T is judged to be factually contravalid on the basis of its relations with a set of observation sentences)
>
> ---
>
> C, I_1, I_2, I_3, ... , I_k are not all true (i.e. they are not all factually valid)

If the test implication T is judged to be *factually contravalid* on the basis of observation sentences which are themselves assumed to be factually valid, then the inference is made that either C or some subset of the auxiliary hypotheses I_1, I_2, I_3, ... , I_k or both, is factually contravalid. As a practical procedure, such auxiliary hypotheses should be checked during the course of the empirical test period. Grounds for rejecting curricular claim C exist only when there is assurance that each of the auxiliary hypotheses is valid, and also assurance that the observation sentences are valid.

* *Analysis of the manner in which instructional claim validity is confounded with curricular claim validity will be the concern of future conceptual investigations.*

Decision Rules For Judging Factual Validity Of Singular Curricular Or Instructional Claims

Determination of the factual validity of an educational program (a system of claims) involves (1) judgments of singular curricular or instructional claims, and (2) judgments of the set of related claims. This section deals with the first aspect, namely, judgments of the factual validity of singular curricular or instructional claims, while the following section is concerned with judgments of factual validity of an educational program.

Acceptance or rejection of a curricular or instructional claim is made on the basis of judgments as to whether conditions defined by extra-logical components of the claim have been fulfilled. The realization of any extra-logical component of a claim may be judged to be either consistent, inconsistent, or indeterminate with respect to predictions and explanations derived from the extra-logical component. The factual validity of a curricular or instructional claim may be judged to be either *factually valid, factually contravalid, or factually indeterminate,* where that decision depends upon the judgments made as to realization of the means and qualifier components of that claim.

The relationships between the judgments of factual validity of the claim and judgments as to realization of its extra-logical

components are shown in Figure 3. This figure, in effect, sets forth the decision rules for determining the validity of a claim (curricular or instructional).

If any of the extra-logical components are judged indeterminate, then the judgment as to the validity of the curricular or instructional claim is indeterminate. The figure does not distinguish among the many possible indeterminate combinations, since the judgment of the validity of the claim is always the same, namely "indeterminate."

Figure 3

VALIDITY OF INSTRUCTIONAL OR CURRICULAR CLAIM

RELATIONS OF OBSERVED PERFORMANCE TO PREDICTIONS OR EXPLANATIONS DERIVED FROM THE CLAIM COMPONENTS	*JUDGMENTS AS TO REALIZATION OF CURRICULAR OR INSTRUCTIONAL CLAIM COMPONENTS*			*FACTUAL VALIDITY OF THE CLAIM*
	Qualifying Conditions Satisfied By Pupil?	*Teacher or Pupil Actions Consistent With Procedural Rules?*	*Goal-State Attained By Pupil?*	
	satisfied	consistent	attained	valid
	satisfied	consistent	not attained	contravalid
	satisfied	inconsistent	attained	indeterminate
	satisfied	inconsistent	not attained	indeterminate
	not satisfied	consistent	attained	indeterminate
	not satisfied	consistent	not attained	indeterminate
	not satisfied	inconsistent	attained	indeterminate
	not satisfied	inconsistent	not attained	indeterminate

Decision Rules For Judging Factual Validity Of An Educational Program

Once the judgments of factual validity of each derived or partially derived curricular claim have been made, and the validity of associated instructional claims has also been determined, then judgments of the factual validity of the program-level curricular claims can be made. Once judgments of the latter type are made, one has the information necessary for making judgments as to the factual validity of an educational program. This section deals with this aspect; namely, judgments of the factual validity of an educational program (a system of claims).

The factual validity of an educational program may be judged to be either, *factually valid, factually contravalid, or factually indeterminate,* where that decision depends upon the judgments made as to the factual validity of the singular curricular claims and component sets of instructional claims.

In judging the validity of educational programs, a distinction must be made between two different cases: (1) the case where the program contains curricular claims which are derived from a set of primitive claims, and (2) the case where the program contains curricular claims which are partially derived from a set of primitive claims. This is due to the fact that the auxiliary hypotheses must be taken into account in the second case (where the program contains a set of partially derived curricular

claims); there are no such auxiliary hypotheses in the first case.

The decision rules for judging the factual validity of an educational program in reference to a judgment of only one derived curricular claim are shown in Figure 4. This is the simplest of possible cases, i.e. the inference requires the fewest judgments. This type of educational program, however, is perhaps the least likely to exist in a practical situation; ordinarily lower-level curricular claims are more likely to be "partially derived" in the sense that they utilize information not contained in the program-level curricular claim.

Figure 5 displays the decision rules for judging the factual validity of an educational program in reference to a judgment of only one partially derived curricular claim. These decision rules include judgments of all components contained in Figure 4, plus judgments of the set of auxiliary hypotheses.

Figures 4 and 5 give the decision rules for judging the factual validity of an educational program which contains only one derived or partially derived curricular claim, respectively. However, an educational program is most likely to contain more than one derived or partially derived curricular claim. In this case, judging the factual validity of a program requires consideration of the factual validity of every curricular claim it contains. Figures 6 and 7 display the decision rules for judging

Figure 4

DECISION RULES FOR JUDGING VALIDITY OF AN EDUCATIONAL PROGRAM IN REFERENCE TO JUDGMENT OF A DERIVED CURRICULAR CLAIM

CASE	JUDGMENT AS TO FACTUAL VALIDITY OF:			
	Derived Curricular Claim	*Set Of Component Instructional Claims*	*Program-Level Curricular Claim*	*THE EDUCATIONAL PROGRAM*
CASE A	valid	valid	valid	valid
CASE B	contravalid	valid	contravalid	contravalid
CASE C	indeterminate	_____*	indeterminate	indeterminate

** This symbol indicates that the component may be judged valid, contravalid, or indeterminate.*

Figure 5

DECISION RULES FOR JUDGING FACTUAL VALIDITY OF AN EDUCATIONAL PROGRAM IN REFERENCE TO JUDGMENTS OF A PARTIALLY DERIVED CURRICULAR CLAIM

CASE	JUDGMENT AS TO FACTUAL VALIDITY OF:					
	Partially Derived Curricular Claim	*Component Instructional Claims*	*Program-Level Curricular Claims And Auxiliary Hypotheses*	*Set Of Auxiliary Hypotheses*	*Program-Level Curricular Claim*	*THE EDUCATIONAL PROGRAM*
CASE A	valid	valid	valid	valid	valid	valid
CASE B	contravalid**	valid	contravalid	valid	contravalid	contravalid
				contravalid	contravalid	
				contravalid	valid	
				indeterminate	indeterminate	indeterminate
CASE C	indeterminate	_____*	indeterminate	indeterminate	indeterminate	indeterminate

* *This symbol indicates that the component may be judged valid, contravalid, or indeterminate.*

** *A curricular claim can be judged as F-valid or F-contravalid only if the component instructional claims functioning as auxiliary hypotheses, are all F-valid.*

Figure 6

DECISION RULES FOR JUDGING VALIDITY OF AN EDUCATIONAL PROGRAM IN REFERENCE TO JUDGMENTS OF TWO OR MORE DERIVED CURRICULAR CLAIMS

Judgments Of Curricular Claims	*JUDGMENT AS TO FACTUAL VALIDITY OF:*	
	Program-Level Curricular Claim	*THE EDUCATIONAL PROGRAM*
all valid	valid	valid
all indeterminate	indeterminate	indeterminate
all contravalid	contravalid	contravalid
at least one is indeterminate	indeterminate	indeterminate
at least one is contravalid and all others are valid	contravalid	contravalid

Figure 7

DECISION RULES FOR JUDGING FACTUAL VALIDITY OF AN EDUCATIONAL PROGRAM IN REFERENCE TO JUDGMENTS OF TWO OR MORE PARTIALLY DERIVED CURRICULAR CLAIMS

Judgments Of Curricular Claims	*JUDGMENTS AS TO FACTUAL VALIDITY OF:*			
	Program-Level Curricular Claims And Auxiliary Hypotheses	*Set Of Auxiliary Hypotheses*	*Program-Level Curricular Claim*	*THE EDUCATIONAL PROGRAM*
all valid	valid	valid	valid	valid
all contravalid	contravalid	valid	contravalid	contravalid
		contravalid	contravalid	
		contravalid	valid	
		indeterminate	indeterminate	indeterminate
all indeterminate	indeterminate	indeterminate	indeterminate	indeterminate
at least one is indeterminate	indeterminate	indeterminate	indeterminate	indeterminate
at least one is contravalid and all others are valid	contravalid	valid	contravalid	contravalid
		contravalid	contravalid	
		contravalid	valid	
		indeterminate	indeterminate	indeterminate

the factual validity of an educational program which contains two or more derived curricular claims, and two or more partially derived curricular claims, respectively.

Under these decision rules, a program with an invalid component is an invalid program.* Judging an educational program is somewhat akin to judging a chain in that its strength cannot be greater than the weakest link. It must be recalled that an educational program has been construed as a *system* of interrelated curricular and instructional claims. The view of a program as a *system* demands evaluations which include judgments of that system as a whole.

These decision rules are different from those ordinarily applied to testing a system of propositions of descriptive science. They differ in the significance attached to a judgment that a lower-level hypothesis is factually indeterminate in reference to the observational evidence. The judgment that a derived hypothesis of a scientific system is "factually indeterminate" does not entail the judgment that the whole system of related propositions is also factually indeterminate. The curricular claims (and component instructional claims) of an educational program, however, are connected in ways that, in some respects, are more complex and bind them more tightly than the propositions of scientific systems.

** This assumes no component is indeterminate.*

The claims of an educational program, for example, are connected so that the goal-state of one claim becomes a qualifying condition of another claim; moreover, the goal-states of the lower level curricular claims are cumulative in the sense that their cumulative acquisition must be the empirical equivalent of program goal-state attainment.

From another perspective, the related claims which constitute an educational program are analogous to the working parts of a complex manufacturing system. If any component of the manufacturing system is not functioning properly, adequate goods cannot be produced. Uncertainty as to the quality of any component part produced and assembled at some point of the process yields uncertainty as to the quality of the completed product.

The interrelated sets of decision rules that have been displayed are useful in clarifying both the basic decisions to be made, and the grounds for making those decisions. To this point we have formulated principles for making judgments under three-value logics, where the values are "valid," contravalid," and "indeterminate." As is true in the application of any set of principles to the empirical world, we will -- in practice -- be confronted with the practical problems of implementing this three-value model within real educational circumstances where values are continuous. Consequently, there will be some degree of

uncertainty associated with every judgment of an empirical statement.

In practice, judgments must be made "on balance;" that is by weighing all the relevant evidence, particularly where that evidence is always incomplete, subject to a variety of kinds of sampling and observer errors, and where the evidence may be inconsistent. The decisions made are, in the last analysis, value judgments that should take into account such considerations as the consequences of an error judgment in favor of the relevant claim or program, and the consequences of an error judgment against the relevant claim or program.

SUMMARY AND ASSESSMENTS

Summary

A comprehensive conceptual framework for the validation of educational programs has been proposed. The conceptual framework includes the concept of an educational program as a system of curricular and instructional claims and methods of evaluation which entail a wide range of judgments of both logical validity and factual validity. Judgments of logical validity are made in reference to the internal structure of each of the claims and its various components, the relationships among the claims constituting a program, and the relationships between the component claims of a program and the bases of the profession under which the program is formulated and operates.

The logic of reaching judgments of factual validity of the individual curricular and instructional claims, and of the program as a whole, has been described. Judgments of factual validity of the various component claims, and of the program, are made on the basis of observations of pupil performance and teacher action to determine whether those behaviors correspond to that which is entailed by fulfillment of the goal, rule, and qualifier components of the claims.

Assessments of the Proposed Concepts and Principles

In assessing the merit of the proposed conceptual framework and method for educational program evaluation, one must answer the question: *Does the method include all the kinds of evaluative judgments construed as desirable under the existing credible evaluation models?* The proposed program evaluation methods include a comprehensive range of evaluative judgments classified in other models as "process and product" or "formative and summative" evaluations; such classes of evaluation as "input" and "context" are included as well.

A second question that should be asked is: *Does the proposed evaluative framework and method lead to warranted evaluative judgments that are of a significantly different type and quality from the evaluative judgments made under the existing credible models?* The proposed ways of program evaluation include important types of evaluation which no existing model for educational evaluation takes into account (although they are commonplace in the sciences). For example, the proposed ways of evalution lead to examination and judgment of the relations among the various goal-states and procedural rule-sets contained within a program; and to examination and judgment of the internal structure of those goal-states and procedural rules as well. Further, the concept of a program as a system of propositions -- each having a goal component, a

rule component and a qualifier component -- leads to evaluative judgments as to whether the teacher acts in a manner consistent with the procedural rules (i.e. curricular rules or instructional rules); and evaluative judgments as to whether the pupil acts in a manner that is consistent with the curricular rules. These judgments are necessary to warranted judgments of the effectiveness of a program or any of its curricular or instructional components.

The third question that should be asked is: *Is there good reason to believe that the proposed evaluative framework and method will lead to the development of more effective educational programs?* In answering this question, one must first note the lack of clarity as to the meaning of "educational program" under other evaluation models; the prevailing concepts of "educational program" may be useful in ordinary talk about programs, but they are inadequate for the purpose of credible program evaluation. It should be noted that fundamental inadequacies exist in the current evaluation models; recall, for example, the defect identfied by Stufflebeam as cited on page 1 of this paper. The effectiveness of an educational program is determined to a great extent by the evaluative principles and standards that have guided its formation and cosequent reconstructions.

Where program formation and modification is governed by the evaluative schema proposed in this paper, the disconnectedness and contradictions that ordinarily exist will be eliminated.

Since the program is construed as a system of claims under which both teachers and pupils act, it becomes possible to determine whether a defect lies in the design (represented by the component curricular and instructional claims) or in the manner in which the design is implemented by teachers and pupils. Under other constructs of "educational program," statement and action are confounded, and it is impossible to detect the points of inadequacy. From the perspective of empirical test, application of the principles set forth in the proposed evaluative schema leads to warranted judgments as to program effectiveness. These principles are grounded in the credible principles of hypothesis testing of the empirical sciences; the inferences entailed by prevailing models of educational evaluation do not satisfy these conditions.

A Concluding Note

The constructions of this paper will enable the serious educational program evaluator or developer to become clear as to the object under evaluation or construction; and to reach justified evaluative judgments in reference to both logical relationships and empirical effectiveness. Fundamental defects can be identified. The authors claim that the fundamental defects of educational program evaluation can be resolved only by pursuing a path of the sort described in this paper.

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